CHAPTER 1

INTRODUCTION

Automatic object recognition has diverse applications in various fields of science and technology and is permeating many aspects of military and civilian industries. Autonomous recognition of ships can provide better tracking and automatic monitoring to control from potential enemy ships.

Recent advanced in imaging technology improves its ability to see ships at night and observed ships from any angle. Then, the classification is done to confirm its identity in the case of country of origin and vessels type. So, this project addresses model-based classification of warship of different categories with acceptable accuracy.

1.0 PROBLEM STATEMENT

Automatic ship recognition is an interesting research area in military industry. In current practice, a person is employed to watch the water area constantly to monitor and recognize the type of vessels. This process is very daunting for human to do. In present situation, a monitoring of the coastal area and recognizing the type of vessels that enter the coastline is very important in security. Thus, the use of image processing algorithms that could detect and identify incoming vessels is very useful for automatic system.

Figure 1.1: Left to right: clipped, overlapped with another silhouette

Figure 1.1 shows that classification of objects based on silhouettes is easily affected by scale changes, clipping and occlusions with another silhouettes. Moments based approached use to represent subregion of an object for situations in which only part of object is visible.

1.1 PROJECT GOALS

The main approach is model-based, where the types of warship to be recognized are known in advanced and can be categorized into different classes. Each class is defined by the structures it contains and their arrangement on the deck. The specific library divided into two categories which are Merchant (recorded image) and Combatant type. The specific model database contains 6 classes of ships: destroyer, frigate, aircraft carrier, patrol forces, mine warfare forces and merchant ship.

For each ship silhouette, feature vector will be extracted and calculate moment signatures. Then for testing purpose, compute the signatures for a ship image of unknown type. The unknown type could be change in positions, rotated in certain angle or scaled. Classification is done using the minimum mean distance classification by finding the minimum distance among all pattern vectors. This is done through the representation of means and variance of each class.

1.2 OBJECTIVES OF THE PROJECT

The objectives of this project are:

a. To design, develop and produce technique for the classification of vessels
b. To select features that adequately and uniquely describe the vessels to be identified

1.3 SCOPE OF PROJECT

Many researches have been done in this area using Forward Looking InfraRed (FLIR) images, radar images, simulated images and visual-light images. In this project, the sample data set are the offline ships images which is not applicable for real-time applications.

The design coding will be implemented based on MATLAB 7.0 software using the Image Processing Toolbox. Then, this project need some pre-processing before the objects can be detected to obtain the silhouette images sample data set.

There are some limitations in this project, where the data collections are horizontal view images and the distance of object is unknown. Thus, the proposed algorithm is not intended for satellite or aerial view images.

1.4 PROJECT OUTLINE

The Project is organized into five chapters. The outline is as follows:

- **Chapter 1 Introduction**

  This chapter discusses the objectives and scope of the project and introduces some background with respect to the problem to be solved.

- **Chapter 2 Literature Review**

  This chapter is about previous work regarding to the pattern recognition especially to the vessels classification for military purposes. Moment techniques approach will be explained in details and the chronology of moments invariants apply for pattern recognitions. This chapter also subsumes the classification techniques apply for vessels classifications.

- **Chapter 3 Design Methodology**

  Chapter 3 elaborates the techniques and steps taken to complete the task. The important part is the development phase that explained in detail how to classify imperfect Region of Interest (ROI).

- **Chapter 4 Results and Discussion**

  The results will evaluate all experiments that have been done and discuss the performance of the proposed techniques. Sensitivity analysis of the results is also included.

- **Chapter 5 Conclusion**

  This chapter consists of conclusion for this work. It also describe the problems arises and recommendations for future research.